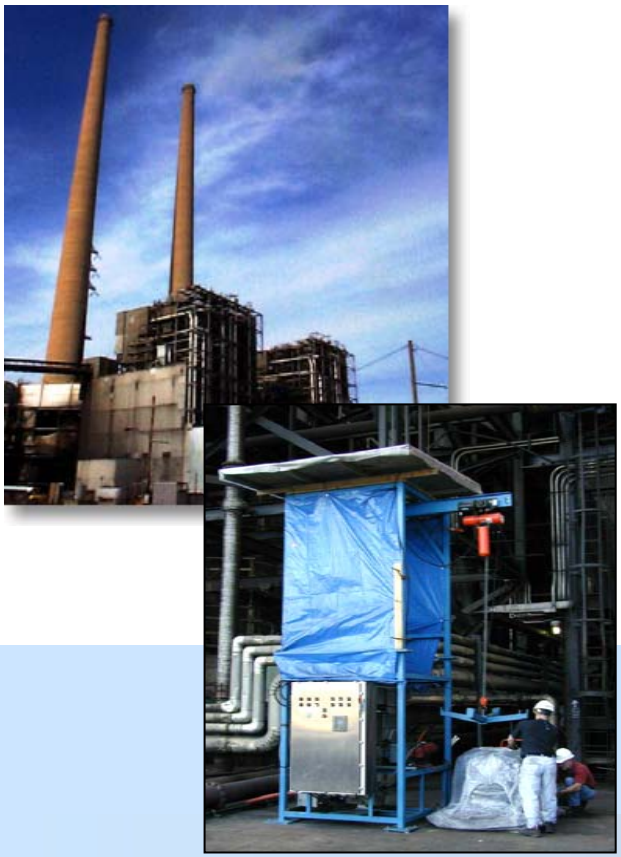
NETL's Phase II Mercury Technology Field Testing Program



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Purpose

The purpose of this solicitation was/is to receive quality applications to perform long-term, large-scale field-testing of promising mercury control technologies at existing power plants firing a variety of coal ranks.

Solicitation Development/Structure

- **Held two workshops to obtain stakeholder input (6/4/02 & 9/12/02):**
- **Proposals Due:**

  Closing Date 1: April 7, 2003

  Closing Date 2: April 30, 2004

  focusing on Powder River Basin, Texas lignite, or coal blends

Cost-sharing

3/4 DOE

1/4 Proposing Team

Requested multi-site proposals with integrated project team

Selections-Closing Date 1

- **Total of 8 selections with 14 unique sites (16 units)**
  - Bituminous - 5
    - 2 Med/High Sulfur Eastern
    - 3 Low Sulfur Eastern
  - Subbituminous - 2
  - Lignite - 5
    - 4 ND
    - 1 Tx
  - Blends - 2
- **No policy factors were applied**

DOE/NETL Phase II Mercury Control Field Test Planning Matrix*

	ESPc (Small)	ESPc (Med)	FF	SD/FF	TOXECON	ESPc/ FGD	ESP/SCR FGD
East Bit Hi S	YY	?	X	X	Y but N/A	Y	X
East Bit Low S	YY	?	X	X	Y (long-term)	Y	X
Sub Bit	X	YY	Y #	Y*	Y but N/A	Y ##	Y ##
ND Lig	X	?	X	Y*	Y but NA	Y	N/A
TX Lig	X	X	X	Y*	Y	Y##	Y ##
W Bit	X	X	Y #	?	Y but N/A	Included in Sub Bit	Included in Sub Bit
Blends							

Y = yes (i.e., conduct field test). * = low Cl. # = either fuel; ## = either configuration
YY = possible multiple tests needed
? = maybe (e.g., how many plants on E. Bit with just ESPc)
E = existing test
Small: SCA < 200 ft2/kacfm; Medium: SCA = 200-350 ft2/kacfm
N/A = not available; X = not critical need – low interest or N/A

* Reference: June 2002 DOE/NETL stakeholder meeting at Air Quality IV conference.

DOE/NETL Phase II Mercury Control Field Test Selected Projects

	ESPc (Small)	ESPc (Med)	FF	SD/FF	TOXECON	ESPc/ FGD	ESP/SCR FGD
East Bit Hi S	YY	?	X	X	Y but N/A	Y	X
East Bit Low S	YY	?	X	X	Y (long-term)	Y	X
Sub Bit	X	YY	Y #	Y*	Y but N/A	Y ##	Y ##
ND Lig	X	?	X	Y*	Y but NA	Y	N/A
TX Lig	X	X	X	Y*	Y	Y##	Y ##
W Bit	X	X	Y #	?	Y but N/A	Included in Sub Bit	Included in Sub Bit
Blends							

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Sorbent Injection

Oxidation

Sorbent & Oxidation

DOE/NETL Phase II Mercury Control Field Test Selected Projects

	ESPc (Small)	ESPc (Med)	FF	SD/FF	TOXECON	ESPc/ FGD	ESP/SCR FGD
East Bit Hi S	YY	?	X	X	Y but N/A	Conesville	X
East Bit Low S	Miami Fort 6 Yates 2	Buck/Allen	X	X	Y (long-term)	Yates 1 Yates 1 Marshall	X
Sub Bit	X	Meramec	Y #	Y*	Y but N/A	Y ##	Y ##
ND Lig	X	Leland Olds 1 Stanton 1	X	Antelope Valley 1 Stanton 10 Stanton 10	Y but NA	Milton Young 2	N/A
TX Lig	X	X	X	Y*	Y	Monticello 3 Monticello 3	Y ##
W Bit	X	X	Y #	?	Y but N/A	Included in Sub Bit	Included in Sub Bit
Blends		Nanticoke St. Clair Leland Olds 1		Holcomb			

Y = yes (i.e., conduct field test). * = low Cl. # = either fuel; ## = either configuration
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Sorbent Injection
Oxidation
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* Reference: June 2002 DOE/NETL stakeholder meeting at Air Quality IV conference.

DOE/NETL New Phase II
Mercury Control Field Test Projects

Project Title	Lead Company	Test Schedule	Host Utility	Test Location	Coal Rank	PM	FGD
Evaluation of Sorbent Injection for Mercury Control	ADA-ES	?	Sunflower Electric	Holcomb	PRB/Bit. Blend	FF	SDA
			Ontario Power	Nanticoke	PRB/Bit. Blend	ESP	---
			AmerenUE	Meramec	PRB	ESP	---
			AEP	Conesville	Bit.	ESP	Wet FGD
Amended Silicates for Mercury Control	ADA Technologies	?	Cinergy	Miami Fort 6	Bit.	ESP	---
Sorbent Injection for Small ESP Mercury Control	URS Group	?	Southern	Yates 1	Bit.	ESP	Wet FGD
			Southern	Yates 2	Bit.	ESP w/ NH_3/SO_3	---
Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems	URS Group	?	TXU	Monticello 3	TX Lignite	ESP	Wet FGD
			Duke	Marshall	Bit.	ESP	Wet FGD
Evaluation of MerCAP for Power Plant Mercury Control	URS Group	?	Great River Energy	Stanton 10	ND Lignite	FF	SDA
			Southern	Yates 1	Bit.	ESP	Wet FGD
Enhancing Carbon Reactivity in Mercury Control in Lignite-Fired Systems	UNDEERC	?	Basin Electric	Leland Olds 1	ND Lignite	ESP	---
			Great River Energy	Stanton 10	ND Lignite	FF	SDA
			Basin Electric	Antelope Valley 1	ND Lignite	FF	SDA
			Great River Energy	Stanton 1	ND Lignite	ESP	---
Mercury Oxidation Upstream of an ESP and Wet FGD	UNDEERC	?	Minnkota Power	Milton R. Young 2	ND Lignite	ESP	Wet FGD
			TXU	Monticello 3	TX Lignite	ESP	Wet FGD
Advanced Utility Mercury-Sorbent Field-Testing Program	Sorbent Technolgies	?	Duke	Buck or Allen	Bit.	ESP	---
			Detroit Edison	St. Clair	Bit./PRB blend	ESP	---

Evaluation of Sorbent Injection for Mercury Control
ADA-ES

- Evaluate full scale sorbent injection with existing pollution-control equipment at four plants.
- Sunflower Electric's Holcomb Station – burns PRB/Bit coal blend and equipped with SDA/FF
- Ontario Power's Nanticoke Station – burns PRB/Bit coal blend and equipped with ESP
- AmerenUE's Meramec Station – burns PRB and equipped with ESP
- AEP's Conesville Station – burns bituminous coal and equipped with ESP and wet FGD

Amended Silicates for Mercury Control
ADA Technologies

- Evaluate a new non-carbon sorbent, Amended Silicates™
- Avoid impact on fly ash sales.
- Full-scale testing at Cinergy's 75-MW Miami Fort Unit 6 – burns bituminous coal and equipped with ESP.

Sorbent Injection for Small ESP Mercury Control
URS Group

- Evaluate sorbents injected upstream of ESP with small specific collection area (SCA).
- Full-scale testing at Southern Company Services' Plant Yates Unit 1 & 2 – burns bituminous coal.
  - Unit 1 equipped with ESP and wet FGD.
  - Unit 2 equipped with ESP and NH_3/SO_3 conditioning.

Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems

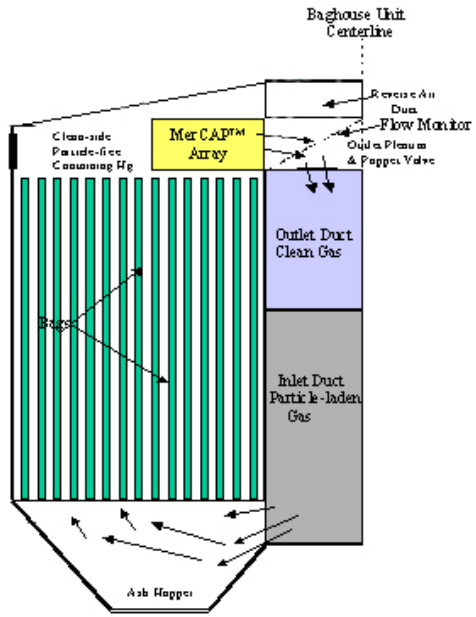
URS Group

- Evaluate honeycomb catalyst system for oxidizing elemental mercury.
- Removal in downstream wet lime or limestone FGD systems.
- Pilot-scale testing conducted over 14 months at two plants.
- TXU Monticello Unit 3 – burns Texas lignite.
- Duke Energy's Marshall Station – burns low-sulfur bituminous coal.
- Both plants equipped with ESP and wet FGD.

Evaluation of MerCAP for Power Plant Mercury Control

URS Group

- Evaluate EPRI's Mercury Control via Adsorption Process (MerCAP^{TM}) technology.
- Regenerable, gold-coated fixed-structure sorbent.
- Mercury not contained in combustion by-products.
- Testing at two plants over a six month period.
- Great River Energy's Stanton Unit 10 – burns ND lignite coal and equipped with SDA/FF. (Full-scale at 6 MW equivalent)
- Southern Company Services' Plant Yates Unit 1 – burns bituminous coal and equipped with ESP and wet FGD. (Pilot-scale at 1 MW)



Enhancing Carbon Reactivity in Mercury Control in Lignite-Fired Systems

UNDEERC

- Enhance effectiveness of activated carbon injection for plants burning low-rank lignite coals.
- Evaluate two different approaches:
  - Use of chlorine-based additive to coal and activated carbon sorbent.
  - Use of chemically treated sorbents.
- Full-scale testing at four units burning North Dakota lignite coal.
- Basin Electric's 220 MW Leland Olds Station Unit 1 – equipped with ESP.
- Basin Electric's 440 MW Antelope Valley Station Unit 1 – equipped with SDA/FF.
- Great River Energy's 140 MW Stanton Station Unit 1 – equipped with ESP.
- Great River Energy's 60 MW Stanton Station Unit 10 – equipped with SDA/FF.

Mercury Oxidation Upstream of an ESP and Wet FGD

UNDEERC

- Evaluate chloride-based additive to increase mercury oxidation upstream of ESP and wet scrubber.
- Full-scale testing at two plants burning lignite coal and equipped with both ESP and wet FGD.
- Minnkota Power Cooperative's Milton R. Young Unit 2 – burns ND lignite.
- TXU Monticello Unit 3 – burns TX lignite.

Advanced Utility Mercury Sorbent Field-Testing Program

Sorbent Technologies

- Evaluate novel sorbent.
- Full-scale testing at two plants.
- Duke Energy's Buck or Allen Station, both burn bituminous coal and equipped with ESP.
- Detroit Edison's St. Clair Station - burns mixture of bituminous and subbituminous coal and equipped with ESP.

DOE Cost

Application	Selected	Applicant	DOE FY03 Funding	DOE FY 04 Funding	DOE FY05 Funding
		ADA ES	$900,000	$1,200,000	$2,400,000
		UNDEERC	$500,000	$1,000,000	$2,100,000
		Sorbent Technologies	$600,000	$1,400,000	$1,000,000
		URS	$ 300,000	$458,005	$
		ADA Technologies	$	$500,000	$300,000
		Topic Area 3			
		URS	$	$700,000	$685,185
		UNDEERC	$ 600,000	$ 1,250,000	$352,195
		Topic Area 4			
		URS	$ 576,000	$ 500,000	$ 37,262
		FY DOE TOTAL	**$3,476,000**	**$7,008,005**	**$6,874,642**
		DOE TOTAL	**$18,979,659**		

*Total projects costs - $ **26,142,782** **27.4**% cost share